A rare case of fenoxaprop-P-ethyl poisoning: Presenting as acute myocardial infarction

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Received - 08 June 2018 Initial Review - 02 July 2018 Accepted - 18 September 2018

ABSTRACT

Fenoxaprop-P-ethyl (FPPE) is a phenoxy herbicide and exerts its herbicidal action by interfering with fatty acid biosynthesis through inhibition of acetyl-CoA-carboxylase in plant chloroplast and thereby hampering fatty acid synthesis. It also inhibits this enzyme in the mammalian liver and has produced reversible hepatic toxicity in laboratory studies. Poisoning with this herbicide is uncommon, and herbicide product appears to be safe in patients with an acute self-poisoning, particularly in comparison with other herbicides and causing few clinical features. Here, we report the case of a 35-year-old male patient presented with FPPE poisoning. He came with an altered sensorium and later on developed acute myocardial infarction. Even after appropriate management, the patient deteriorated and succumbed.

Keywords: *Acetyl-CoA-carboxylase, Fenoxaprop-P-ethyl, Myocardial infarction*

Fenoxaprop-P-ethyl (FPPE) is a phenoxy herbicide, and it exerts its herbicidal action by interfering with fatty acid biosynthesis through inhibition of acetyl-CoA-carboxylase in plant chloroplast and thereby hampering fatty acid synthesis [1]. It also inhibits this enzyme in the mammalian liver and is responsible for reversible hepatic toxicity in laboratory studies [2,3]. Poisoning with this herbicide is uncommon, and herbicide product appears to be safe in patients with an acute self-poisoning, particularly in comparison with other herbicides and causing few clinical features. The main clinical features reported so far were an epigastric burning sensation and vomiting [4-6].

We report the case of a 35-year-old male patient presented with FPPE poisoning. After an extensive literature search, we could not find fatal cardiotoxicity by FPPE. This is the first described case.

CASE REPORT

A 35-year-old male patient reported to our hospital with a chief complaint of intentional ingestion of approximately 200 ml of FPPE 9.3% (herbicide) by the name "whipsuper" at around 10:15 am at home. Later (after 15 min), when the family members recognized the consumption, he was taken immediately to a local hospital where gastric lavage was done and subsequently shifted to our multispecialty hospital.

In the casualty, the patient was drowsy, disoriented,and was not responding to verbal commands. On examination, the patient was afebrile, pulse rate: 110/m, blood pressure: 94/60 mmHg, SpO2: 97%, and cardiovascular, respiratory and gastrointestinal systems were normal. The patient was given gastric lavage initially and was stabilized with intravenous fluids in casualty and later shifted to the intensive care unit for further management.

Routine blood investigations were as follows: Hemoglobin%: 13.6 g/dl, total leukocyte count: 13,800/mm^3, platelet count: 2.82 lakh cells/mm^3, serum creatinine: 1.2 mg/dl, blood urea: 23 mg/dl, serum sodium: 142 meq/l, potassium: 4.13 meq/l, total bilirubin: 0.73 mg/dl, serum glutamic oxaloacetic transaminase: 45 U/l, serum glutamic pyruvic transaminase: 31 U/l, and serum albumin: 4.1 g/l. Arterial blood gas analysis: pH: 6.874, PCO_2: 19.9, PO_2: 267, HCO3: 05. His lipid profile and high-sensitivity C-reactive protein levels were normal.

Plasma samples were stored at −80°C and analyzed by liquid chromatography-tandem mass spectrometry. 50 µL of plasma and 150 µL of internal standard (etofenprox) solution were vortex mixed and centrifuged. Tandem mass spectrometer was used with an electrospray ionization source in positive mode. Weighted quadratic regression was used to measure the FPPE concentration over the range 0.5–50 ng/mL. The patient's plasma concentration was 3.43 ng/ml (IQR: 0.818–3.05 ng/ml).

On day 2, the patient was perspiring and electrocardiography (ECG) changes were noticed which were suggestive of an acute ST elevation and the anterior wall myocardial infarction. The creatine kinase (CK) levels (CK-muscle/brain) done at that time were 154 IU/L (normal levels 15–35 IU/L). In view of ECG changes and raised enzymes levels, we made a diagnosis of myocardial infarction

and the patient was thrombolysed with injection streptokinase 1.5 million units and managed conservatively afterward.

A coronary angiogram was done next day which revealed normal coronaries without any evidence of atheromatous plaque. The patient went into cardiogenic shock 6 h after thrombolysis. Inotropic supports were started. The patient was intubated and taken on a mechanical ventilator in view of falling saturation and tachypnea. The patient remained in shock in spite of ionotropic support. On the 3rd day of consumption, he went into cardiorespiratory arrest and could not be revived and died. The body was subjected for postmortem, but the relatives did not consent.

DISCUSSION

Various drugs and poisons are known to cause myocardial infarction, such as cocaine, amphetamines, ephedrine, carbon monoxide, aconite, and rarely organophosphorus compound. A study was conducted by Zawahir *et al.*, in a random sample of 96 patients, who presented with consumption of FPPE. They observed that there were no serious adverse clinical sequelae on admission and thereafter [3]; however, in the present report, the patient died due to various complications and cardiorespiratory arrest.

Mechanism of cardiotoxicity by these compounds is still completely unknown although there are few mechanisms postulated according to which there are three phases of cardiotoxicity: Brief period of increased sympathetic tone, prolonged period of parasympathetic activity, and QT prolongation followed by torsades de pointes [7,8]. Other possible mechanisms include sympathetic/parasympathetic overactivity, hypoxemia, acidosis, dyselectrolytemia, and direct cardiotoxicity. Coronary vasospasm is an important factor in the pathogenesis of myocardial infarction. Furthermore, there is an increased release of catecholamines and other vasoactive amines (histamines and neutral proteases) by pesticides that penetrate the collagen matrix of the plaque, thereby producing erosions and rupture which can lead to myocardial injury. These substances exaggerate endothelial dysfunction, intensify platelet aggregation and sympathetic activity, and cause reduction of nitric oxide (NO) synthase activity in the vascular wall. A low level of basic NO secretion due to the impairment of endothelial function and increased contractility due to higher kinase Rho/Rho activity is mentioned as the most important causes inducing vasospasm.

Among other factors predisposing to vasospasm are: Increased sympathetic activity, oxidative stress, chronic inflammation and hypomagnesemia. Other factors which can lead to spasm of the coronary artery are genetic factors such as polymorphism of the gene responsible for the synthesis of nitric oxygen synthase and synthesis of paraoxonase [9].

Another mechanism of spasm was described in the course of Kounis syndrome. Kounis syndrome is a generalized allergic reaction, which can be triggered by medication and leads to degranulation of mast cells. These mast cells are localized in the adventitia of coronary arteries and near the plaque. Kounis syndrome is characterized by a sudden release of inflammatory markers such as histamine and proteolytic enzymes (chymase and tryptase) which causes lysis of collagen covering the plaque. These reactions lead to the release of thrombogenic materials and activation factors of the coagulation cascade. Moreover, other substances are released into the circulatory system, such as products of arachidonic acid metabolism, cytokines, chemokines and platelet activating factor [10-12].

CONCLUSION

Acute human poisoning with FPPE has been studied. As per the current knowledge, this herbicide has got low case fatality rate and is less toxic as compared to other pesticide formulations. However, this case report demonstrates the contrary. In our case, the patient presented with altered sensorium developed acute myocardial infarction and even after appropriate management deteriorated and succumbed. This case report also highlights that, irrespective of the formulation, acute self-poisoning of any pesticide should be managed with equal alarm.

REFERENCES

1. Burkle W, Schmidt E, Rutz U. Fenoxaprop-ethyl Metabolism in Rats Orally Administered at Two Doses, 2 and 10 mg/kg body weight. DPR, Pesticide Registration Library Doc. No. 51910-031. California: Hoechst Roussei Agri-Vet Company; 1985.
2. Smith AE. Environmental fate. J Agric 1985;33:483.
3. Zawahir S, Roberts DM, Palangasinghe C. Acute intentional self-poisoning with a herbicide product containing fenoxaprop-P-ethyl, ethoxysulfuron and isoxadifen ethyl. A prospective observational study. Clin Toxicol (Philadelphia, Pa) 2009;47:792-7.
4. Gunnell D, Eddleston M, Phillips MR, Konradsen F. The global distribution of fatal pesticide self-poisoning: Systematic review. BMC Public Health 2007;7:357.
5. Fenoxaprop-p-ethyl Final Work Plan (FWP) Registration Review February 2008. Available from: http://www.epa.gov/oppsrrd1/registration_review/fenoxaprop/index.htm. [Last accessed on 2018 Apr 13].
6. Manual on the Development and use of FAO and WHO Specifications for Pesticides, March 2006 Revision of the 1st edition. Rome, Geneva: FAO, WHO; 2006.
7. Ludomirsky A, Klein HO, Sarelli P, Becker B, Hoffman S, Taitelman U. Q-T prolongation and polymorphous (torsade de pointes) ventricular arrhythmias associated with organophosphorus insecticide poisoning. Am J Cardiol 1982;49:1654-8.
8. Anand S, Singh S, Saikia UN, Bhalla A, Sharma YP, Singh D. Cardiac abnormalities in acute organophosphate poisoning. Clin Toxicol 2009;47:230-5.
9. Kusama Y, Kodani E, Nakagomi A, Otsuka T, Atarashi H, Kishida H, *et al.* Variant angina and coronary artery spasm: The clinical spectrum, pathophysiology, and management. J Nippon Med Sch 2011;78:4-12.
10. Ridella M, Bagdure S, Nugent K, Cevik C. Kounis syndrome following beta-lactam antibiotic use: review of literature. Inflamm Allergy Drug Targets 2009;8:11-6.
11. Biteker M, Duran NE, Biteker FS, Civan HA, Kaya H, Gökdeniz T, *et al.* Allergic myocardial infarction in childhood: Kounis syndrome. Eur J Pediatr 2010;169:27-9.
12. Kounis NG, Hahalis G, Theoharides TC. Coronary stents, hypersensitivity reactions, and the Kounis syndrome. J Interv Cardiol 2007;20:314-23.

Funding: None; Conflict of Interest: None Stated.

How to cite this article: Gupta A, Acharya S, Shukla S, Daphale AA. A rare case of fenoxaprop-P-ethyl poisoning: Presenting as acute myocardial infarction. Indian J Case Reports. 2018;4(5):377-378.

Doi: 10.32677/IJCR.2018.v04.i05.014